10 CFR 50.73

A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear Generating Station

Robert S. Bement
Vice President
Nuclear Operations

Tel (623) 393-6116
Fax (623) 393-6077

Mail Station 7602
PO Box 52034
Phoenix, Arizona 85072-2034

102-05670-RSB/SAB/JAP/REB
March 20, 2007

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 3
Docket No. STN 50-530
License No. NPF 74
Licensee Event Report 2006-005-01

Attached please find supplemental Licensee Event Report (LER) 50-530/2006-005-01 prepared and submitted pursuant to 10 CFR 50.73. The original LER reported a manual reactor trip due to an imminent loss of main feedwater. This supplement contains updated cause and corrective action information related to this event.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the NRC Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact James A. Proctor, Section Leader, Regulatory Affairs, at (623) 393-5730.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

Robert S. Bement

RSB/SAB/JAP/REB/gt

Attachment

cc: B. S. Mallett — NRC Region IV Regional Administrator
M. B. Fields — NRC NRR Project Manager - (send electronic and paper)
M. T. Markley — NRC NRR Project Manager - (send electronic and paper)
G. G. Warnick — NRC Senior Resident Inspector for PVNGS

IE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Palo Verde Nuclear Generating Station Unit 3	05000530	1 OF 6

4. TITLE

Manual Reactor Trip Due To Loss Of Main Feedwater

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									None	05000
07	01	2006	2006	- 005 -	01	03	20	2007	FACILITY NAME: None	DOCKET NUMBER: 05000

9. OPERATING MODE

1

10. POWER LEVEL

55

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
James A. Proctor, Section Leader, Regulatory Affairs - Compliance	623 393 5730

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
E	SF	FDM	N/A	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On July 1, 2006 at approximately 19:28 Mountain Standard Time (MST) Unit 3 was in Mode 1, Power Operation, at approximately 100 percent rated thermal power when a sight glass on a condensate demineralizer ruptured. This resulted in a low pressure condition at the suctions for both main feedwater pumps. One of the pumps tripped causing a reactor power cutback and subsequent decrease in reactor power to approximately 55 percent rated thermal power. Suction pressure to the other main feedwater pump remained low and a control room operator manually tripped the reactor. No engineered safety feature system actuations occurred and none were required.

The sight glass rupture occurred because of undetected defects to the glass. The root cause was alternatives to single pane borosilicate glass were not recognized as being needed. The sight glass was replaced. The station will install condensate demineralizer sight glasses that are more resistant to catastrophic failiure.

No similar event has been reported in the last three years.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station Unit 3	05000530	2006	-- 005	-- 01	2 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

All times in this report are approximate and Mountain Standard Time (MST) unless otherwise noted.

1. REPORTING REQUIREMENT(S):

This LER (50-530/2006-005-01) is being submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A), to report the manual actuation of the reactor protective system (RPS)(EIIS – JC) in response to a loss of main feedwater. Specifically, the reactor was manually tripped from approximately 55 percent rated thermal power due to the loss of the A train main feedwater pump and the imminent loss of the B train main feedwater pump.

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

Main Condensate and Feedwater

The condensate (CD)(EIIS - SD) and feedwater (FW)(EIIS – SJ) system supplies the steam generators with heated FW in a closed steam cycle using regenerative FW heating. The main portion of the feedwater flow is deaerated condensate pumped from the main condenser hotwells by the condensate pumps. The condensate pumps discharge to six parallel condensate demineralizers (EIIS – SF), which may be fully or partially bypassed. Five of the six service vessels are required for 100 percent condensate flow. From the demineralizers, condensate flows through three parallel trains of low-pressure heaters, each train consisting of four sequential low-pressure heaters. The two FW pumps in parallel take suction from the fourth low-pressure feedwater heaters and discharge through the two parallel trains of high-pressure feedwater heaters into the two steam generators (SG) (EIIS – AB). A feedwater low suction pressure trip is provided for each FW pump; time delays on each trip prevent pump trips during spurious low pressure transients.

Reactor Power Cutback System (RPCS) (EIIS – JD)

The RPCS is a control system designed to accommodate either large load rejections or the loss of one feedwater pump by providing a "step" reduction in reactor power. The step reduction in reactor power is accomplished by the simultaneous dropping of preselected groups of full length regulating control element assemblies (CEAs) (EIIS – AA) into the core. The CEA groups are

dropped in their normal sequence of insertion. The RPCS also provides control signals (setback/runback) to the turbine to rebalance turbine and reactor power following the initial reduction in reactor power as well as to restore steam generator water level and pressure to their normal controlled values.

3. INITIAL PLANT CONDITIONS:

Unit 3 was operating at 100 percent power with the SGs in elevated blowdown rates to reduce sodium contamination which occurred on the day prior, June 30, 2006. Full condensate flow was being routed through the condensate demineralizers.

4. EVENT DESCRIPTION:

On July 1, 2006, at 19:25 the Unit 3 control room received low condensate discharge pressure alarms and low FW pump suction pressure alarms and "trip ckt (circuit) energized" alarms on both "A" and "B" FW pumps. Following the "A" FW pump trip and RPCS signal at 19:26, the "B" FW pump low suction pressure trip reset (feedwater pump suction pressure was temporarily restored prior to the delay circuit time having elapsed). Reactor power reduced to 55 percent power after the RPCS programmed CEAs dropped, steam bypass valves actuated, and turbine setback and runback reduced turbine load. Low hotwell level alarms began at 19:27 and the "B" FW pump low suction trip alarm energized at 19:28. The Shift Manager (SM) (utility – licensed) observed the actions being carried out in response to the reactor cutback for a loss of a FW pump. The secondary reactor operator (RO) (utility – licensed) reported rapidly decreasing hotwell levels. Upon receipt of the "B" FW pump low suction "trip ckt energized" alarm, the SM determined that conditions were rapidly degrading and directed the control room supervisor (CRS) (utility – licensed) to trip the reactor. The CRS directed the primary RO (utility – licensed) to trip the reactor, which was accomplished at 19:28. The control room staff used the non-essential auxiliary feedwater pump "N" (EIIS – BA) to control SG water level manually and stabilized the plant in mode 3 at normal operating temperature and pressure.

The CRS and ROs completed standard post trip actions and entered emergency operating procedure 40EP-9EO02, Reactor Trip. The CRS determined no emergency classification was

required.

At the time the event started, the condensate demineralizer operator (utility – non-licensed) was in the control room. Upon arrival at the east end of the turbine building, the operator observed the water stream issuing from the demineralizer area. The operator also noted that the water had spilled out of the turbine building into the yard. After verifying that the demineralizers had been bypassed, the operator isolated demineralizer "A" service vessel, from which the water stream issued.

The failed sight glass (Jacoby Tarbox Model 5200-PVQ-450, no EPIX code) was a 7 inch diameter, 1-5/8 inch thick, borosilicate glass, flanged to provide a 6 inch diameter view port on the bottom portion of the "A" condensate demineralizer service vessel.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

I The plant remained within safety limits throughout the event. No engineered safety feature system actuations occurred and none were required. There were no structures, systems, or components that were inoperable at the time of the event that contributed to this condition.

The spilled condensate contained low levels of tritium (1.22E–5 uCi/ml) which flowed out of the Turbine Building into the yard and subsequently into the north and south lined storm drains. In the storm drains, the spilled condensate became impounded behind concrete dams where it mixed with rain water from a prior storm.

I Leakage of reactor coolant to the SG secondary side was < 1 gallon per day on June 30, 2006. Tritium from low level primary-to-secondary leakage and prior operating history was present in the secondary system, including the spilled condensate. The maximum sample tritium result of the impounded water was 3.2E-6 uCi/ml. No gamma emitting isotopes were detected in water, soil, or resin samples taken after the spill. The impounded tritiated water was within the limit for discharge to the on-site evaporation pond (1.0E-3 uCi/ml) and was subsequently pumped to the evaporation pond via the site retention basin. The spillage out of the Turbine Building flowed as intended to the storm drain, did not accumulate in puddles, and will not impact groundwater.

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

Because the spilled condensate that flowed outside the turbine building was within limits for discharge to the evaporation pond, was contained, and will not impact groundwater, the safe operation of the plant or health and safety of the public was not adversely affected.

The condition did not prevent the fulfillment of any safety function and did not result in a safety system functional failure as defined by 10CFR50.73(a)(2)(v). Note that safety functions are: reactor shutdown, heat removal, control of the release of radioactive material, and mitigation of the consequences of an accident.

6. CAUSE OF THE EVENT:

The direct cause of the ruptured sight glass was normal system operating pressure acting on undetected defects in the borosilicate glass that rapidly propagated, resulting in catastrophic failure of the glass. This failure mechanism had not previously occurred at the station. Previous Palo Verde history indicated that any leakage would be due to gasket age or chipped glass sealing surface. Therefore, the need for alternatives to single pane borosilicate glass was not recognized.

The root cause of the failure was that alternatives to single pane borosilicate glass were not recognized as being needed to protect personnel or production.

The lack of a periodic inspection program for sight glasses was a contributing cause.

7. CORRECTIVE ACTIONS:

The failed sight glass and gaskets were replaced and retested satisfactorily via an in-service leak test. The Operations Water Treatment team leader (utility – non-licensed) and the responsible mechanical system engineer (utility – non-licensed) performed separate walkdowns of condensate demineralizer sight glasses and identified three chipped sight glasses. Two sight glasses were replaced on Unit 3 vessel E and Unit 1 vessel C in July 2006 and the third scratched sight glass was replaced on Unit 2 vessel D in August 2006.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station Unit 3	05000530	2006	-- 005	-- 01	6 OF 6

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

The action to prevent recurrence is to install alternative MetaGlas sight glasses on condensate demineralizer service vessel viewports. These style sight glasses are known to be resistant to catastrophic failure. The installation of the new sight glasses will be accompanied by respective monitoring and preventive maintenance recommendations for the new sight glasses.

Other corrective actions that were completed included the implementation of procedure instructions that require inspection of station sight glasses, including condensate demineralizer service vessels, as part of area operator watchstanding and rounds.

8. PREVIOUS SIMILAR EVENTS:

Arizona Public Service reported no similar event to the NRC within the last three years caused by the rupture of a condensate demineralizer service vessel sight glass.